

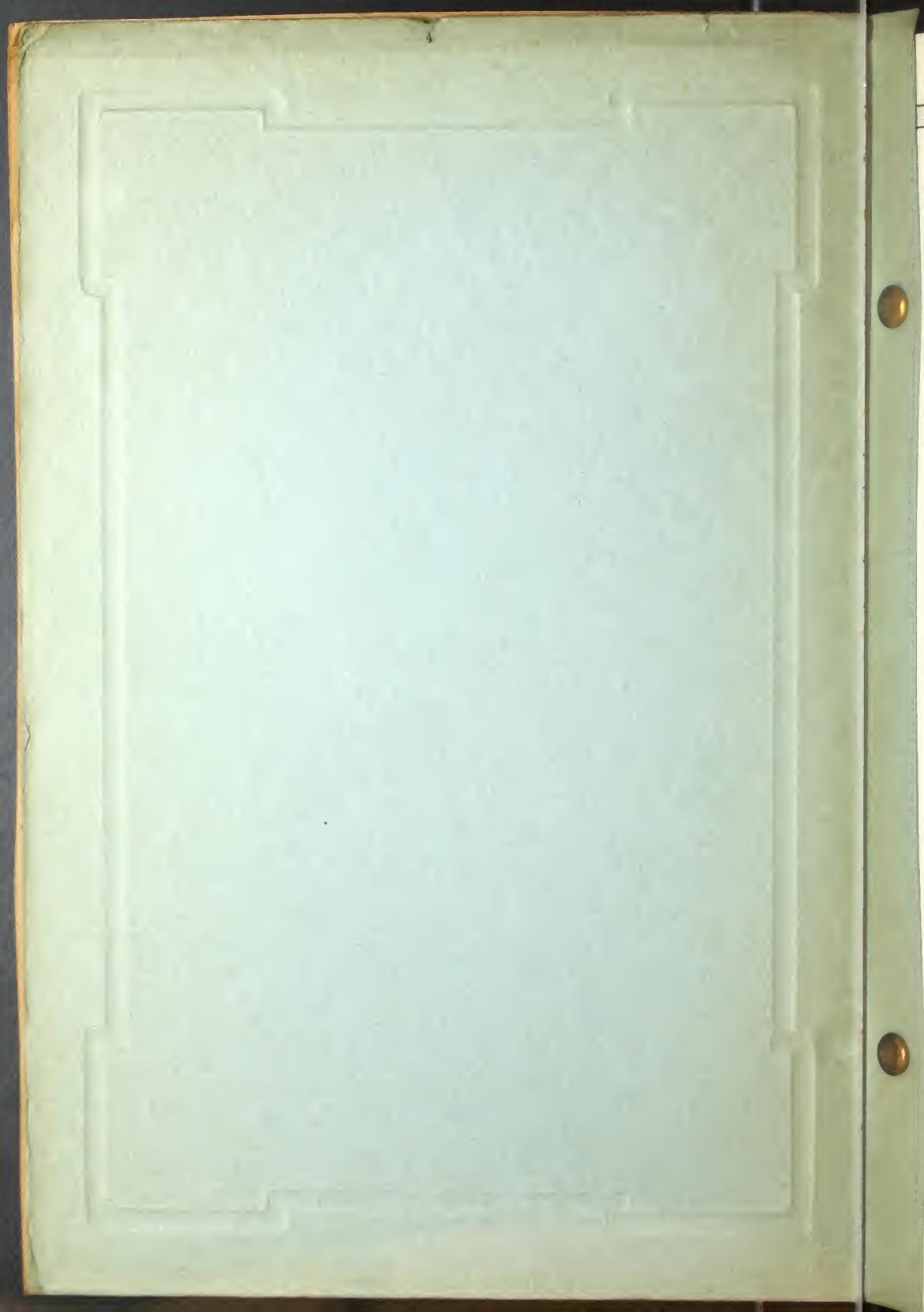
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Webster

Air Conditioning Apparatus



ATMOSPHERIC CONDITIONING CORPORATION
LAFAYETTE BUILDING
PHILADELPHIA



Webster Air Washers

General Description



Bulletin No. 50

ATMOSPHERIC CONDITIONING CORPORATION
LAFAYETTE BUILDING
PHILADELPHIA



Plymouth Congregational Church, Seattle, Wash.



Union Station, Indianapolis, Ind.



The Harry Elkins Widener Memorial Library, Cambridge, Mass.



City Hall, Indianapolis, Ind.



West Philadelphia High School, Philadelphia, Pa.



Children's Hospital, Boston, Mass.



Wilson Building, New York City



Ritz-Carlton Hotel, Philadelphia, Pa.



Railway Exchange Building, St. Louis, Mo.



Horlick's Malted Milk Co., Racine, Wis.

Webster Air Washers are in use in each of the above representative buildings

The Permanent Place of the Air Washer in Heating and Ventilation Practice

PERFECT ventilation, to whatever type of building it may be applied, includes the installation of apparatus by which the quality of the air is rendered such as to contribute its utmost to human comfort. Not only must its purity be the maximum obtainable, so far as the absence of noxious gases and odors is concerned, but it must be cleansed of all floating particles of dust and foreign matter and maintained at the proper percentage of humidity.

While the greater frequency of air change incident to improved ventilation reduces the degree of vitiation caused by bodily emanations, in other respects it aggravates the difficulties of providing air of the proper quality for breathing. From the very fact that larger quantities of air are circulated in a given time, it follows that more impurities are brought into the building and more moisture is removed from it; for outdoor air always carries dust and impurities and heated air possesses great avidity for moisture.

Air constantly renewed is bound to absorb moisture from anything it comes in contact with. This action is particularly rapid in winter because of the lower absolute humidity out of doors and the consequent extreme dryness of this air when heated for indoor use. Circulation of very large volumes of comparatively dry air forms an undoubted menace, and aside from the patent evidence of uncleanliness that dust displays, its deleterious effects are well known. Certainly if these large volumes of air are to be circulated through buildings, it is but the part of wisdom to first rid it of dirt that would otherwise be deposited inside the buildings.

As the dust nuisance is magnified by mechanical circulation of air, so is the detrimental influence of low humidity indoors in the winter season aggravated by modern ventilation. More air comes into contact with the body in a given time because of the positive circulation, and therefore its effect is more pronounced. In the summer season the humidity inside a building is in general very close to that of outdoors, as the temperatures are approximately the same; but in winter there is a large discrepancy, due to the great temperature difference between indoors and outdoors. Although the outside air in winter may be of a normal percentage of humidity at low temperature, this air when brought into a building and heated to 70 degrees or thereabout would practically be of the same absolute humidity as before, but its relative humidity or percentage of saturation would now be very greatly reduced.

Earlier Methods of Air Cleaning

Dry cleaning by filtering through coarse cloth screens was tried early, but the simplicity of this method was more than offset by the time, trouble and expense of frequent removal, cleaning and renewal of these screens. Moreover, much finely divided dust passed through, and unless the screens were frequently cleaned, they clogged enough to cut down the air supply.

Water as a cleansing auxiliary has been introduced in various ways. The coke screen, consisting of a wall of coke between two wire screens, with water trickling over the whole, proved better than the cloth screen, although open to many of the same objections. This type of screen occupied too much space, choked the air passages and consequently diminished the air volume, at the same time forming spaces where bacteria could lodge and propagate.

Another form of wet screen consisted of an endless burlap belt hung over a revolving roller and dipping into water at the lower end. The wet burlap collected dust on its trip across the air duct, and, on entering the water, deposited the foreign matter and was remoistened. This scheme, like those previously mentioned, failed because it was neither thorough nor automatic.

Many other more or less ingenious devices were found wanting before engineers realized that real efficiency could be accomplished only by imitating nature.

Nothing takes fine dust particles out of air so thoroughly as water. If air is passed through one or more groups of water particles, the affinity of the latter for solid matter can be utilized to effect practically complete removal. This, in short, is the principle of the modern Air Washer. Exactly as rain clears the atmosphere does the spray of the Air Washer cleanse air brought into a building. The action is continuous, with but slight resistance to the incoming air, can be made entirely automatic, and provides an unfailing clean air supply—all with practically no maintenance expense save for the operation of a small centrifugal pump to operate the sprays. So evident were the advantages of such an Air Washer that, upon its introduction, previous types of air washing apparatus were quickly abandoned.

Development and continual testing in the experimental plant in which Webster Air Washers were perfected soon demonstrated other possibilities for Air Washers than the mere removal of dirt. It was found that air passing through a washer in winter had very agreeable and useful qualities due to the moisture absorbed. The next step, therefore, was to devise means for automatically regulating the moisture content.

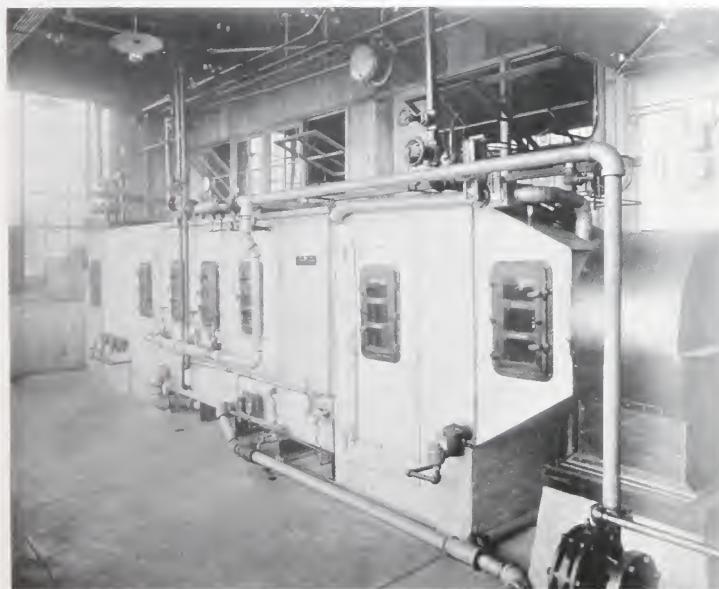
Early efforts toward humidification were based upon direct injection of steam into the air or placing water surfaces in the air passages. The first in addition to being non-automatic had the two faults of imparting an unpleasant odor to the air and permitting particles of vapor to be carried into the room as free

moisture. The second method was neither automatic nor susceptible even of hand regulation, and could not provide enough free water surface for adequate disengagement of vapor. These and similar impractical methods have been discarded in favor of improved systems based upon the use of Air Washers.

The Air Washer, on the other hand, made possible the automatic regulation of humidity, and when equipped with the Webster System of Humidity Control the regulation is accomplished with simple, accurate and practical thermostatic devices that are readily understood by all engineers. In this way, the cleansing and humidifying operations can be perfectly combined in the one apparatus and the disadvantages of previous humidifying efforts entirely eliminated. Apparatus equipped in this manner is known as a Webster Humidifier.

Cooling

Another inherent advantage in the Air Washer which adds to refinement in ventilation is the ability to produce a marked degree of cooling in summer incidental to the cleansing process.



View of Experimental Laboratory where Webster Air Conditioning Apparatus was perfected

The cooling effected by recirculating spray water is entirely due to evaporation and is in direct proportion to the wet bulb depression of the entering air. The temperature of the recirculated spray water continuously remains the same as the wet bulb temperature of the initial air, and the air leaving the washer when thus operated varies from 60 to 100 per cent. of the difference between the dry and wet bulb temperature, according to the type of Webster Air Washer used.

For a period extending over several years, this Company conducted exhaustive tests and experiments with the view toward ascertaining what cooling results could be obtained by Webster Air Washers for various outside temperatures and humidities, and with spray water maintained at different constant temperatures. The information thus secured at great labor and expense was carefully compiled and enables us to accurately design an apparatus to give any desired result.

If artesian well water at a temperature of 50 to 60 deg. F. is available, it is possible in a very economical manner to cool and dehumidify the air, which after reheating to the desired temperature has an increased absorption capacity. For installations of this character we recommend apparatus specially designed for the purpose, and this Company now has low temperature drying plants in successful operation.

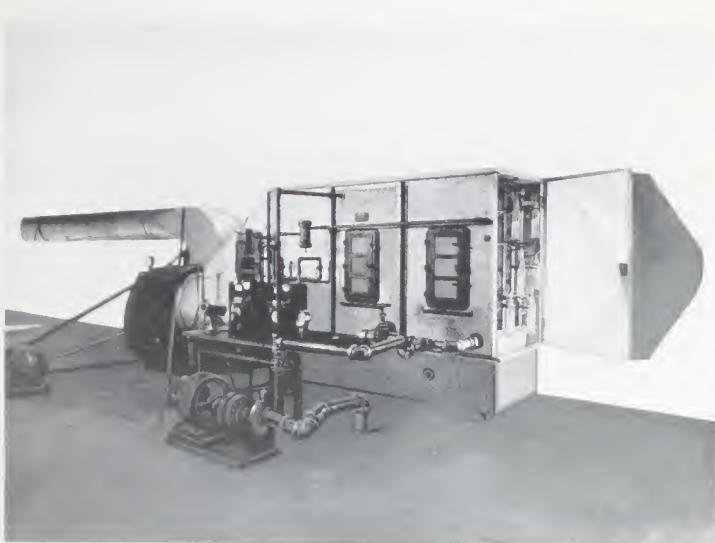
When artesian well water is not at command, specially designed Webster Air Conditioning apparatus in conjunction with refrigerating apparatus presents an economical solution of the cooling and dehumidifying problem as compared with the use of brine coils, over which the air to be cooled is passed.

Engineers or owners contemplating the installation of apparatus for cooling, either for comfort or industrial processes, will find it to their advantage to consult us upon the subject.

While the Air Washer may be applied to the ventilating system in every type of building where people are housed, it may be of interest to note the position taken by Perry West, of the Newark, New Jersey, School Board, in his paper read before the January, 1919, meeting of the American Society of Heating and Ventilating Engineers, in which the subject of air conditioning as applied to school-house ventilation is logically treated:

"The questions that are immediately before us are: (A) What are the necessities for air washing and humidification in our schools? (B) To what degree do commercial air washers and humidifiers meet these necessities?

"The necessities for air washing and humidification in connection with a ventilation system are:



Webster Air Washer of special construction used by Chicago Ventilation Commission for experimental purposes

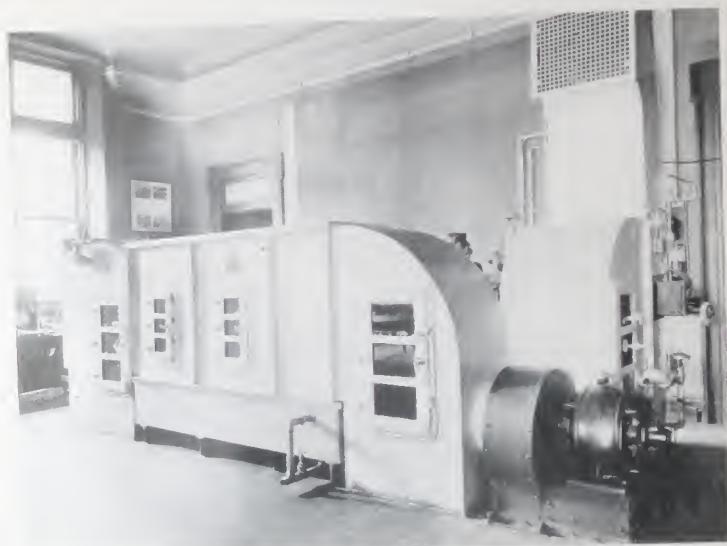
First. To supply the proper degree of relative humidity to mechanically ventilated spaces.

Second: To cleanse the incoming air of dust particles, bacteria, gases, acid fumes, etc.

Third: To dissipate electrostatic charges, so as to reduce nervous irritation and facilitate the precipitation of indoor dust, which does not come in with the air of ventilation.

"Regarding the first of these necessities, i.e., the supply of the proper degree of humidity, it is a well established fact, as has been shown by the Chicago Ventilation Commission working on this subject for about ten years, the New York State Commission on Ventilation working on it for over five years, and a great many doctors, physiologists and other scientific investigators, that for every degree of temperature and velocity of air motion there is a proper degree of relative humidity.

"It is also a well established fact that a greater or less degree of humidity causes irritation and discomfort, either from a sensation of cold, or from a nervous irritation, due to the rate of evaporation from the respiratory tissues and the skin. This is more readily understood by careful consideration of the following physiological phenomena:



Special "Type A" Webster Air Washer installed in the American Museum of Safety, New York City

"The human body is an isothermal machine, always generating heat, but never varying in temperature under normal conditions more than one degree above or below the normal. This generated heat must be dissipated at a proper and even rate in order to maintain this heat balance; a too rapid dissipation produces a sensation of chilliness and a retarded dissipation produces a sensation of nervous irritation and enervation. The dissipation of this heat takes place by radiation, by convection and by evaporation. While the relative humidity of the surrounding atmosphere has little bearing upon the rates of radiation and convection, it has a very marked bearing upon the rates of evaporation. Since, with the other two factors constant, the drier the air the more rapid the rate of heat loss from the body by evaporation, and with the other two factors constant, the warmer the air the less rapid the rate of heat loss from the body by radiation and convection, it is evident that as the degree of relative humidity of the surrounding air is increased its temperature must be decreased, and as its temperature is increased its degree of relative humidity must be decreased, in order to keep the heat balance stable.

"It is also a well established fact that with all of these factors constant, the higher the velocity of air motion the greater the rate of heat loss, and vice versa.

"It is evident, therefore, that for every change in relative humidity we must make corresponding changes in air temperature, in air motion, or in both, if the proper air conditions are to be preserved. Since we have no practical means of automatically correlating these factors, except by keeping all of them constant, we must maintain a constant degree of relative humidity.

"All that has been said regarding this particular necessity for air washing and humidification has to do with the comfort of the children and includes freedom from nervous irritation, chilliness and enervation.

"To refer a little more particularly to this matter of enervation, it has been conclusively proven by the New York State Commission on Ventilation that the enervating effect of 78 deg. as compared with 68 deg. for the air surrounding pupils in a class room amounts to at least 35 per cent. of the subjects' inclination for work; in other words, the 10 deg. which it is possible to reduce the temperature of comfort during winter months by the addition of the proper degree of humidity to the air increases the capacity of children for work about 35 per cent.

"Considering these three factors only"—"we can readily see that the idea of air washing and humidification is the one thing to differentiate modern from obsolete ventilation."



Rear view of Webster Air Washer shown on opposite page

This apparatus is used daily for conditioning the air in the American Museum of Safety

With regard to the numerical measure of the necessity for humidification, Mr. West states that:

"On a zero day, with an average of 50 per cent. relative humidity outside, the air contains about $\frac{1}{4}$ grain of moisture per cubic foot. This air would require to be heated to a temperature of about 85 deg., and would have a relative humidity of 2 per cent. in order to be made comfortable. This does not mean, however, that this air would not be very enervating at this high temperature.

"Taking our average weather conditions for the months of December, January, February and March, the average outdoor temperature is about 35 deg., and the average relative humidity about 60 per cent. Each cubic foot of air under these conditions contains about $2\frac{1}{2}$ grains of moisture and would require to be heated to 80 deg., and have a relative humidity of 23 per cent. in order to be made comfortable. Here again we have a temperature which is entirely too high and very devitalizing but which is made necessary for comfort on account of the low relative humidity of the atmosphere.

"In either case the ideal condition would be about 67 deg. temperature and 50 per cent. relative humidity."



Academic Building, Johns Hopkins University, Baltimore, Md.
Engineering Building at the same institution also equipped with Webster Air Washer



Reed, Murdoch & Co., Wholesale Grocers, Chicago, Ill.

Equipped with approximately 60 "Type A" Webster Air Washers

In continuing his discussion of the subject, Mr. Weben says:

"Regarding the second necessity for air washing and humidification, i.e., for cleaning the incoming air, it should be noted that the air at one great cities today contains from 100,000 to 1,000,000 dust particles per cubic foot of air, as high as 200 counts of bacteria, and varying percentages of gases from ammonia and carbon from factories, etc.

"Dust, as we all know, is most unhealthy, both on account of being a source of irritation and inflammation of the lung and respiratory system, and on account of being the principal carrier of the floating bacteria in the air. Dust, especially carbon, has unhealthy and irritating, according to their sizes and qualities.

"Regarding the third necessity for air washing and humidification, i.e., for the dissipation of electrostatic charges, we should realize that a great deal of the irritating and irritating state of improperly conditioned air is due to this electrostatic charges. Air is charged with static electricity in a great many ways, and especially is water, as are usually charged to a greater or less degree.

"These charges are generated by heat, by evaporation and by friction, etc., and their effect, as far as we are now concerned, is that they play a great part in producing that irritating and depressing feeling so noticeable just before a heavy thunder storm, also that they cause dust particles to repel one another and to fly about in a most bumptious manner instead of settling to the floor. All of this means that air on being heated and forced through ducts, etc., becomes charged, with the result that it is irritating, depressing and a disturber of chalk and other dust in the class rooms.

"Having considered the principal necessities for the cleansing and humidifying of air for ventilation, the next question is—in what measure do commercial air washing and humidifying apparatus fulfill these requirements?

"First, there is no question in the minds of those familiar with such apparatus that properly designed air washers and humidifiers will produce and maintain any desired degree of humidity within the possible range, regardless of outside atmospheric conditions.



View of Webster Spray Chamber, Swift & Co. Office Building
Spray chamber is 30 ft. long and consists of two groups of nozzles like those shown here

"Second, as to the removal of dust and bacteria, we have a number of authentic tests which demonstrate that a proper air washer will remove from 50 to 98 per cent., depending upon the fineness of the dust and its nature. For ordinary conditions met with in school-house ventilation, I think that we are safe in assuming that a proper washer will remove at least 90 per cent. In practical tests in the Newark schools, we have removed as high as five pails of mud from a single air washer per week. Also there is a school in Brooklyn, N. Y., where they also removed five pails of mud from a single air washer in a week's time.

"Third, as to the removal of gases, we, of course, realize that a proper air washer should remove the greater percentage of soluble gases. There is the case of the school in Philadelphia, Pa., reported by the Health Officer at the National Convention of School Superintendents, at Philadelphia, 1913, where a sample of the water taken from the air washer was two-thirds dirt and carbon, about 20 per cent. oil, and a large percentage of gasoline. The gasoline was found to burn freely when a match was applied. This school was located near a garage from which the gases found their way into the fresh air intake."



View of Webster Eliminator, Swift & Co. Office Building, which removes all free moisture from air after passing through the spray shown on opposite page

Note cooling coils in tank below

Webster Air Conditioning Apparatus has been brought to its present high standard after many years of investigation and tests in our Laboratory, equipped with an apparatus of commercial size and in which we experimented continuously for several years with various phenomena of cooling, humidifying, dehumidifying, drying, etc. The data thus accumulated have enabled us to perfect the many basic improvements upon which the design of our various types of equipment are founded.

This plant, arranged to demonstrate any type of Webster Washer or Air Conditioning Apparatus, included every desirable thermostatic control device available so as to enable us to find out exactly what regulation could be obtained and guaranteed with safety.



U. S. S. Recruit, Union Square, New York City, used as recruiting station during the war

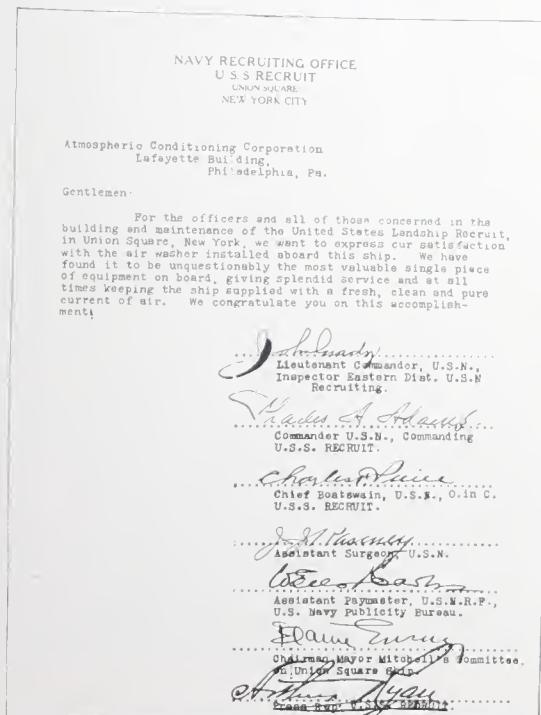
Air below decks conditioned by Webster Air Washer

WEBSTER AIR WASHERS

In May, 1917, we were approached by the Navy Recruiting Office, who had in charge the building of a station in the form of a "battleship," then being built in Union Square, New York, and being unable to build a complete new apparatus before the day this ship went into service we loaned the committee our complete laboratory equipment, and which did service for cleansing and cooling the air below decks.

This apparatus was recently returned to us somewhat deteriorated, but as soon as we are able to renew the worn parts and erect it in place it will be available for demonstration and tests as in the past.

An illustration of the apparatus as it appeared in our Laboratory originally will be found on page 5, while a view of the U.S.S. Recruit where it did "war duty" is shown on page 14.





Spray Chamber View of a Webster Air Washer showing
Mist Nozzles in Operation

Design of the Webster Air Washer

The basic elements of the Webster Air Washer to secure desirable cleaning and cooling effects are as follows:

A spray chamber containing a series of nozzles for injecting water, in the form of finely divided particles or fog, into the incoming air.

A set of eliminator baffles at the spray chamber outlet for catching and removing from the purified air any remaining entrained free-floating moisture and dirt particles.

A tank into which the dust particles and spray water fall and to provide storage for the water supply for the spray heads.

A circulating pump and piping system for recirculating the water from the tank to the nozzles.

The air supply is preferably drawn, although it may be blown through the Air Washer by means of a fan, a process which often requires air supply ducts fitted with adjustable dampers, and drawing from inside the building or outside or from both in varying proportions.

It is desirable that air entering should be of fairly equal distribution over the spray chamber area and, whenever required, provision should be made for the necessary deflectors at a point just ahead of the spray chamber to equalize the distribution.

Upon entering the spray chamber, the air comes in intimate contact with the spray water and the floating dirt particles are precipitated. Passing into the eliminator, the air is baffled so as to remove all entrained moisture and such solid matter as may have escaped the spray. From this stage, distributing ducts carry the purified air to its point or points of use, while the spray water returns to the tank to be recirculated by the pump.

The desirability of supplying apparatus that will most efficiently and economically provide the required degree of cooling and humidification in ordinary service has led to the standardization and marketing of two distinct designs of Webster Air Washers, known respectively as "Type A" and "Type B."

Both of these are obtainable in a wide range of sizes and capacity (see Bulletin No. 120, Webster Air Washer Specifications), and when properly operated are guaranteed to remove 98 per cent. of all solid matter from the air in passing, removing all entrained water and free moisture from the air supply.

Both "Type A" and "Type B" Webster Air Washers are designed for a velocity not exceeding 500 feet per minute through the spray chamber under ordinary conditions, and at such velocity offer a resistance of .25 inch water gauge to the passing air.

The Webster System of Automatic Humidity Control is adaptable to both Type A and Type B Washers. For details of this system and for methods of specifying under varying conditions see other bulletins.

WEBSTER AIR WASHERS



The Webster Spiral Mist Nozzle
(Patented)

Construction Details of Webster Air Washers

The construction of Webster Air Washers throughout is based upon practical well-balanced design to assure service, low operating expense and resistance to deterioration. The power requirements are the minimum that will do the work with ample safety margin, and the selection of material is right for strength, longevity and the lowest consistent first cost. The accessibility of all parts permits the apparatus to be kept clean and sanitary with a negligible amount of labor.

The following descriptions of details will aid in a general way in becoming familiar with operating principles and quality of material.

Casing

The casing forming the spray chamber and enclosing the eliminator is regularly constructed of sheet metal braced on the exterior with angle irons riveted in place and spaced not over three feet apart. To facilitate handling in erection, the casing is built in three parts—the top and two sides. These are bolted together and to the tank with gaskets and waterproof cement, so as to secure rigidity and watertightness. Convenient inspection doors are placed in the casing as required by the type of apparatus. These doors give access to every portion of the spray chamber and make possible its sanitary maintenance, a feature highly essential.

The glass-paned hinged doors and their frames are of cast iron, of large size, and are held shut by cams and made watertight by packing in a groove around the frame. A small gutter under the door collects any water that may leak out and returns it to the spray chamber.

Mist Nozzles

The Webster Mist Nozzle (see page 18) is made of brass, in three parts—base, cap and spiral—which gives incoming water a rotary motion. This centrifugal action produces perfect atomization with a water pressure averaging only $1\frac{1}{2}$ pounds per square inch. To insure proper atomization and also uniform density of the mist within the spray chamber, each nozzle in the main spray system handles not more than 2 gallons of water per minute. The discharge orifice of each nozzle is $3/16$ inch in diameter, large enough to prevent clogging and to avoid the necessity of automatic flushing devices and their uncertainty.

The mist nozzles are tapped into risers arranged uniformly in banks extending vertically across the entire spray chamber, and are close enough together for the sprays of adjacent nozzles to interlace and form a dense mist through which the air must pass.



The Webster "Type A" Air Washer

Designed primarily for air washing and cleansing in connection with heating and ventilating systems in public buildings, where moderate cooling effect by evaporation is desired.

Is guaranteed, when operating at its rated capacity, to remove 98 per cent. of all solid matter contained in the entering air.

To cool the entering air during the summer, not less than 70 per cent. of the initial wet bulb depression when recirculating the spray water, and to offer a resistance to the passing air of not more than .25 inch water gauge.

Spray Chamber

The arrangement of nozzles inside the spray chamber constitutes one of the principal points of difference between "Type A" and "Type B" Washers. *Type A* Spray Chamber: One main series of mist nozzles 4 feet 3 inches away from the eliminator and discharging in the direction of air flow, presents a large aggregate surface area of water particles for wetting and precipitating the dust particles and lowering the air temperature.

A series of flooding nozzles for operation under 5 pounds pressure, and placed just in front of the eliminator, may be operated either in conjunction with or independently of the main series.

In hot, humid summer weather and other periods of high outdoor humidity, the flooding nozzles are particularly advantageous, for by their use alone excellent cleansing effect is secured, while the evaporation or the absorption of moisture by the air in passing the spray water is considerably less than the evaporation taking place with the main series in action.

Type B Spray Chamber: The spray water is injected into the air by two series of mist nozzles, one discharging with the air current and the other against the air current. The connections to each group are valved separately so that either may be used independently. Both in use together give the greatest possible cooling effect obtainable by evaporation.



One of five floors of Swift & Co. General Office Building, the temperature of which was maintained at 79° F. with an outside temperature of 102° F. during the Summer of 1918, by the use of a Webster Air Washer

See illustrations on pages 12 and 13



The Webster "Type B" Air Washer

Designed for air washing and cleansing in public buildings and industrial plants, where the greatest possible cooling effect by evaporation is desired.

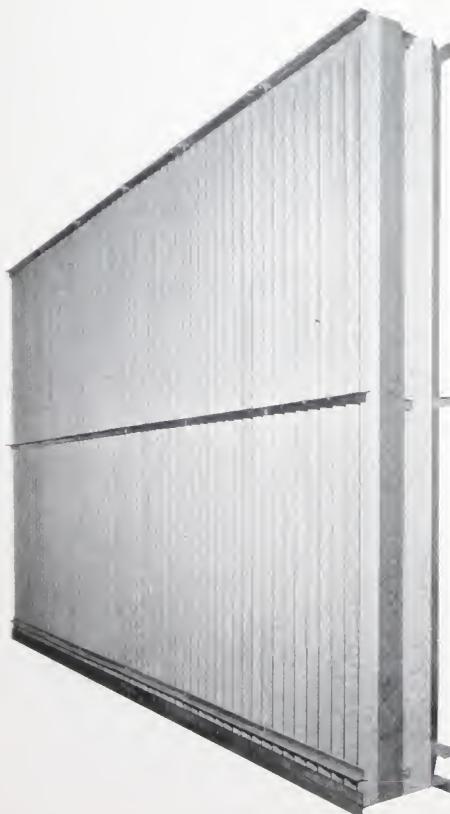
Is guaranteed, when operating at its rated capacity, to remove 98 per cent. of all solid matter contained in the entering air.

To cool the air during the summer to the saturation point when recirculating the spray water, and to offer a resistance to the passing air of not more than .25 inch water gauge.

Flooding nozzles applied in a similar manner to those referred to above are also used in the "Type B" apparatus, the same advantageous features prevailing.

Eliminator

For removing the free moisture from the air after the latter has been subjected to the sprays, two vertical rows of V-shaped sheet metal baffles are extended across the air passage at the far end of the spray chamber.



Webster Eliminator furnished with all Webster Air Washers

Guaranteed to remove all free moisture from the passing air and so constructed as to be fully accessible for cleaning

These baffles deflect the air four times, each deflecting surface being not less than 5 inches long and making an angle of 30 deg. with the normal path of air travel. The front and rear rows of baffles are staggered so that the air streams after two deflections by the first row are split by the edges of the second row. This ingenious arrangement effectively forces into contact with the second row of baffles the fine water particles in the interior of the streams formed by the first baffles and thoroughly removes any remaining moisture.

This construction also admits of spacing the baffles on 3-inch centers, far enough apart to make the eliminator surfaces readily inspected and cleaned, a feature now demanded in high grade air washer construction because of sanitary requirements that all surface where foreign matter could possibly accumulate be easily accessible. The wide spacing, together with the fact that no single air-current deflection is over 30 deg., is also an important factor in keeping the resistance and fan-power requirements low.

Tank

A tank 15 inches deep and extending under the entire spray and eliminator chambers gives a large water storage capacity and ample space for the precipitation of dirt removed from the air.

The tank is made from heavy gauge sheet metal that is well able to resist corrosive influences and is reinforced with angles around the edges. All seams are riveted and soldered to insure watertightness.

For automatically supplying the water and maintaining proper water level, the tank is provided with a ball-float valve of the balanced type, which closes tight against ordinary pressures. The float is of heavy seamless copper and the arm is adjustable to maintain the desired water level.

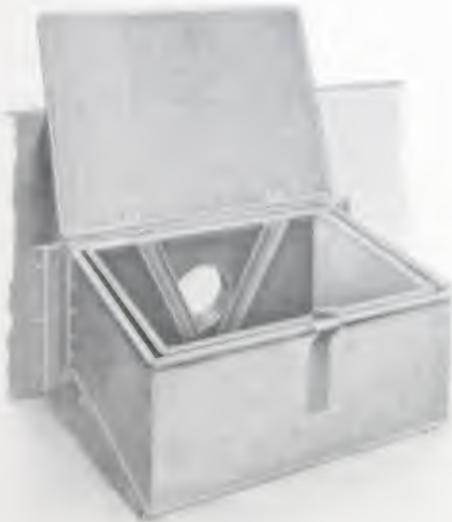
To prevent the tank from overflowing on the floor in case of accident an overflow outlet and drain connection to sewer are provided. For quick emptying, the tank is provided on the bottom with a large flanged opening that may be connected to the sewer. The valve on this outlet can be located at the side for easy access.

Strainer

The pump suction is provided with a strainer within the tank, to keep the circulating water free from matter which might clog the spray nozzles. This strainer is completely submerged so that no air can get into the pump line. The filtering surfaces of the strainer are made of perforated brass screen, strong enough and reinforced to resist collapse when heavily coated with scale. The perforations are small enough to stop passage of objectionable matter yet large enough not to clog quickly.

The outer casing of the strainer or the inner sheet metal is provided with lugs on the outer side, these project in grooves fastened to the wall of the tank, making the strainer removable. The hinged lid permits easy removal of the inner box and cleaning by flushing from the inside with a hose.

Wherever pipes pass through the air washer tank or casing the flanges are riveted and soldered to the sheet metal, bush nuts and the nozzle serving to preserve tightness.



Webster Double Box Brass Strainer, for use in Webster Air Washers with Sheet Metal Tanks

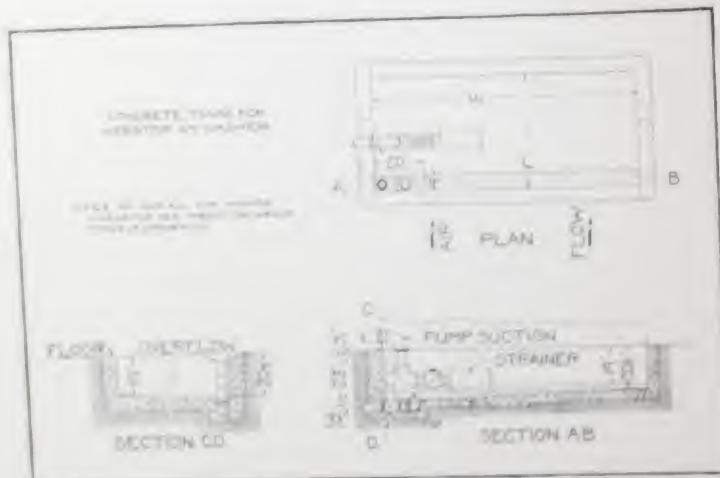
Concrete Tank

Frequently the ceiling height and width of space available for an Air Washer is limited, in which instance a special concrete tank, built in below the floor level, may be substituted for the standard metal tank and a saving of head room effected.

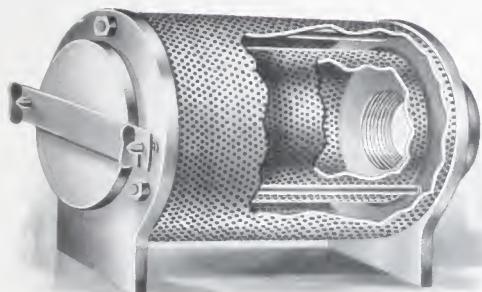
The floor in front of the Air Washer should be graded so that any moisture getting outside will drain into the tank. The tank bottom is inclined toward the point where the drain and overflow are located.

The drain and overflow consist of a cast-iron elbow with brass plug and chain and galvanized iron pipe with the necessary fittings, all of which are furnished as part of the Air Washer and are to be embedded into the concrete at the time the tank is poured.

The pump suction connection extended into the tank is provided with a check valve and draws from one end of the double cylindrical strainer. This strainer consists of two perforated brass cylinders arranged concentric and between cast iron heads, to give double filtration. The inner basket of the strainer has a free area of over 15 times the area of the pump suction and is removable for cleaning.



Typical Construction of Concrete Tanks for Webster Air Washers



Double Cylindrical Brass Strainer for use in Webster
Air Washers with Concrete Tanks

Pump

A highly efficient double suction centrifugal pump of ample capacity is furnished to maintain proper pressure at the spray nozzles. The type of pump which we recommend, although we will furnish others, has a horizontally split casing which permits interior inspection without disturbing pipe connections.

A direct-connected electric motor is the favored method of driving, but steam turbine, engine or belt drive is sometimes preferable. Any standard make of driving unit may be used.

The pump is connected to the driving unit through a flexible coupling and the combined unit is mounted on a heavy cast-iron bed plate.

Nickel-plated 3½-inch pressure gauges are furnished for tapping into supply line of each group of main sprays and flooding nozzles.

The outside valves, fittings and piping are not furnished as a standard part of the apparatus but will be included, if desired, at reasonable extra cost.

The pipe lines between pump and Air Washer should always have long-sweep fittings to reduce friction losses.

Electric Motor Starters

Starters are regularly furnished with all direct-current and single-phase A C motors, also with polyphase A C motors $1\frac{1}{2}$ h.p. and larger. Starters for smaller polyphase A C motors are not regularly required and are not furnished except where specifically mentioned.

Important

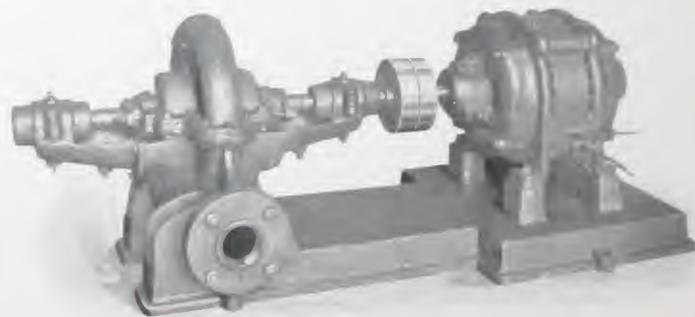
To secure the full benefit from an air washer installation it should be maintained in a sanitary condition, and above all else should be operated whenever the ventilating fan is in service. Means should be provided to prevent the operation of the fan without the Air Washer.

Air Washer Illumination

An electric marine light with vapor-proof globe should be placed in the top of the connection between tempering coil and Air Washer as well as in the spray chamber and beyond the eliminators.

Illumination of all interior parts of the apparatus facilitates inspection and cleaning, a feature most important in its upkeep and the maintenance of sanitary conditions.

These marine light fixtures are not furnished as part of our equipment, except where specified.



Type of Double Suction Centrifugal Pump Direct Connected to Electric Motor,
furnished with all Webster Air Washers

Application of the Webster Air Washer for Cleansing and Purifying

General

The Webster Air Washer can be installed to advantage in any building to be heated and ventilated by a fan system, and can be added to old heating and ventilating systems of this type if proper space is available for the admission of the apparatus. The installation of an Air Washer prevents dust, dirt and soot from entering rooms; does away with black dirt formation around air-inlet registers, which is nearly always found where fan systems are installed without Air Washers; prevents rapid deterioration of interior decorations; and when used in connection with stores is of exceptional value in preventing deterioration of stock.

The savings made through the agency of clean air, as well as the assurance given of comfort and health, make the Webster Air Washer a particularly desirable investment in connection with fan systems of heating and ventilation in buildings of all types—hotels, schools, churches, libraries, theatres, department stores, office buildings, as well as numerous industrial plants such as textile mills, lithographing establishments, paint shops, candy and food product manufactories, laboratories, chemical works, etc.

See separate bulletin for detailed information regarding our equipment for maintaining "artificial atmospheric conditions in industrial plants."

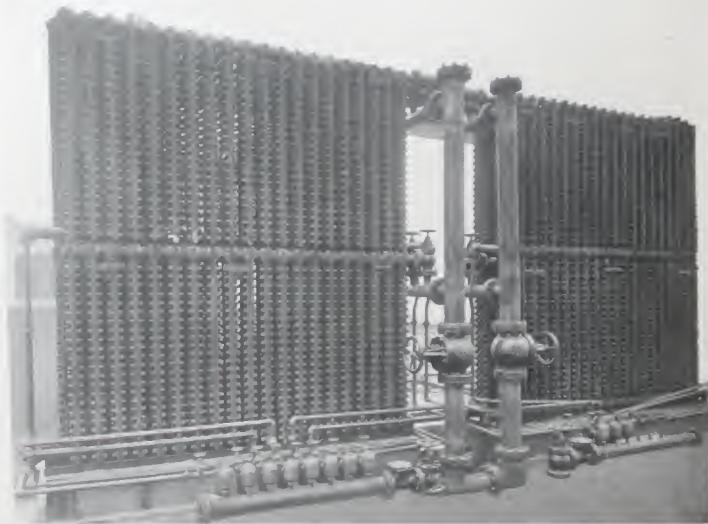
Application

The exact method of application of the Webster Air Washer must of necessity be determined by the conditions prevailing in each case; usually the air passes from outdoors into the fresh-air chamber, then through a tempering coil which heats the air generally to a temperature of from 40 to 55 deg. F. It then passes in succession through the Air Washer, where it is thoroughly cleansed and purified, to the fan, the operation of which insures a constant and uniform movement of air, to the reheater which heats the air as required, thence through air ducts to the rooms supplied. By the addition of the familiar by-passes under heating coils, mixing dampers, thermostat, etc., it is now possible to supply a constant predetermined volume of pure air to the rooms and maintain in these rooms any desired temperature.

Air Supply

In an ordinary mechanical heating and ventilating system without an Air Washer it is vitally important that the air be taken from a point most remote from contamination by dust and odors. This usually entails the carrying of a shaft above the roof and reducing the total available floor area in the building in proportion to the number of stories. Even then clouds of smoke may sweep across from near-by chimneys and nullify the attempt to provide pure, fresh air for the occupants.

But where a Webster Air Washer is employed the air may be taken from the most convenient source at the street level, with the assurance that it will be thoroughly cleansed and purified before it is distributed through the building. The necessity of a large fresh-air shaft extending to the roof is thereby removed and the loss of floor area, which often involves a considerable reduction in the rental income of a building, is entirely avoided, aside from the fact that the first cost of an Air Washer installation is usually less than the cost of a brick or concrete fresh-air shaft extending to the roof.



Tempering coils of the cast-iron type installed in connection with large Webster Air Washer equipment in a prominent industrial plant having four apparatus in use handling a total of 271,000 cu. ft. of air per minute



East Side High School, Cincinnati, Ohio

Equipped with five Webster Air Washers aggregating 141,000 cu. ft. capacity

Tempering Coil

The tempering coil which is placed on the inlet side of the Air Washer is of vital importance in all installations situated in localities where the temperature is liable to go below the freezing point, especially when all of the air handled in the system is taken from outdoors. The absence of this coil, the function of which is to heat the incoming air to a certain temperature above the freezing point, is likely to cause serious difficulty during cold weather.

While it is possible to prevent the spray water in the tank and the spray device from freezing, by warming the water circulated, the fact remains that the cold incoming air will cause coatings of ice to form on the sides of the spray chamber casing and especially on the eliminator baffles, which in extreme cases will not only obstruct the passage of the air but cause damage to the apparatus as well.

If all the air handled in the system is not taken from outdoors, but only a volume sufficient to maintain a plenum or slight pressure in the building so as to prevent leakage through windows etc., from without, the balance of the air volume being taken from indoors and recirculated, as is frequently done in factory installations where the primary object is heating and not ventilation, then the tempering coil, of course, may be omitted. In this event the desired temperature of the air entering the Air Washer may be obtained by automatic or hand control of the dampers regulating the mixture of air volumes taken from the two sources.

Office and Bank Buildings

The development of the modern office building has entailed the solution of many problems, not least among which is that of heating and ventilation. When subdivided into many small rooms mechanical ventilation has been somewhat difficult of application, but where the areas are larger, great refinement has been possible. Such a case may be found in the large general office building of Swift & Company, Packers, Union Stock Yards, Chicago, where a remarkable system of heating and ventilation, including a Webster Air Washer, has been in use for several years, recently increased to a 100,000 cubic feet apparatus when the building was enlarged.

This installation is fully described in a 16-page pamphlet which we will be glad to furnish to anyone interested in the subject.

The common practice of devoting several stories—in the form of one large high-vaulted room—to banking purposes and then carrying up the balance of the building to a considerable height and dividing it into relatively small offices, calls for diversity of method in heating and ventilation.

Under these conditions an indirect fan system may be employed for the main banking room and important offices, while the bal-



General Office Building, Swift & Co., Union Stock Yards, Chicago
Equipped with special Webster Difusoration of 100,000 c. f. m. capacity.



Fletcher Savings & Trust Co., Indianapolis, Ind.

In which 60,000 cu. ft. of air per minute is conditioned by two "Type A" Webster Air Washers

ance of the building may be heated by direct steam. The pollution of the average city atmosphere is such as to make it desirable to purify it before being delivered to the rooms supplied by the fan, while the abnormal amount of dirt and dust present in a crowded center, such as is usually occupied by a building of this type, makes imperative the introduction of means for its removal.

The application of a Webster Air Washer not only solves the problem of supplying pure air to the ventilating system, but relieves the unnatural dryness of the heated buildings by imparting to the air a healthful humidity which may be controlled by the Webster System of Humidity Control, as described in detail in another bulletin. In addition to the value of the Air Washer as an air purifier and humidifier it has proved an efficient cooling medium in summer, a feature greatly appreciated by the many users of the Webster Air Washer.

WEBSTER AIR WASHERS



Central Library, Indianapolis, Ind.

Air cleansed and cooled by a 55,000 cu. ft. "Type A" Webster Air Washer



North Denver High School, Denver, Col.

Equipped with two Webster Air Washers aggregating 110,000 cu. ft. capacity

ATMOSPHERIC CONDITIONING CORPORATION

Libraries, Schools, Hospitals

It is particularly important that the air entering the ventilating system in libraries be pure and of the right humidity. If the air is too dry, the glue and paste, as well as the binding of the books, will become brittle and when exposed will crack or break, thereby entailing heavy expense of restoration. It should also be borne in mind that a large number of the country libraries are poorly built and receive little, and it is therefore essential that the circulating system shall provide for an abundant, constant supply of pure air. The movement of pure air maintained at the right humidity in connection with heating and ventilating systems in schools and hospitals has long been the subject ofadolescent and increasing interest and discussions among various medical authorities and the introduction of a Webster Air Washer and Dehumidifying System insures the removal of all dust and impurities from the air entering and closely regulates the humidity at the desired percentage.



Germantown High School, Philadelphia

"During the past year Webster Air Washers have been installed in the Public Schools of Philadelphia, while Webster Washers connected with the Webster System of Automatic Humidifiers, control these systems and give especially satisfactory results, and we are pleased to recommend them to anyone wishing to have an installation of this character.

Yours truly,

J. D. CHASE,
Asst. of Director Public
Schools, City of Philadelphia.

WEBSTER AIR WASHERS



Kedzie Theatre, Chicago, Ill.
Equipped with a Webster Cleansing and Cooling Apparatus



Ball Room and Main Auditorium, Hotel Gibson, Cincinnati, Ohio
Air cleansed and cooled by a Webster Air Washer

Theatres, Auditoriums, Etc.

Wherever people gather in halls of audience, such as theatres, auditoriums, recital halls, it is particularly necessary that ample ventilation at all seasons, as well as means of cooling in summer, shall be provided. In crowded buildings of this type an abundance of pure air is not only a question of bodily comfort but the fulfillment of municipal and state requirements where stringent laws are in effect.

A properly designed ventilating system in conjunction with a Webster Air Washer insures a constant supply of pure air and a material temperature reduction in summer.



The above statement made by the management of The Circle Theatre, Indianapolis, Ind., indicates the satisfactory operation of the Webster Air Washer.

WEBSTER AIR WASHERS



McAlpin Hotel, New York City

Equipped with two copper Webster Air Washers with combined capacity of
70,000 cu. ft. per minute

ATMOSPHERIC CONDITIONING CORPORATION

Hotels, Cafés, Banquet Halls

Owners of hotels will find that by supplying a sufficient volume of fresh, clean air to their dining rooms, cafés, ballrooms and banquet halls, with proper regard for heating and humidifying in the winter and cooling in summer, a discriminating patronage will be assured, and the increasing demand for such refinements makes necessary the installation of Webster Air Conditioning Apparatus.

Hotels and cafés, large and small, scattered throughout the country have such apparatus in use, and those illustrated herein are only representative of their class.

In many, the cooling of the air in summer is effected by the use of cold well water or refrigeration, with the result that the inside temperature is reduced to the point where humidity, so oppressive during days of high outside temperature, is entirely removed.



Main Dining Room, Hotel Gibson, Cincinnati, Ohio

Air cleansed and cooled by a special Webster Air Washer



View of Arcadia Cafe, Philadelphia
Air purified and cooled by a Webster Dehumidifier, Refrigerating Type



July 1st, 1919.

Atmospheric Conditioning Corporation.
Lafayette Building,
Philadelphia, Pa.

Gentlemen:-

We are pleased to advise that the Webster Dehumidifier, installed by you in the Arcadia Cafe in 1917, has given us most satisfactory results.

Aside from the effective cleansing of the air at all times, we were able during the extremely warm days of last summer, to cool the air, used in our ventilating system, to a very appreciable degree.

In fact, when the outside humidity is high, our cafe is always found comfortable and well patronized, and we heartily recommend your apparatus to others who desire to secure ideal atmospheric conditions.

Yours very truly,

Facsimile letter from Arcadia management

Clubhouses and Fraternal Buildings

The cleansing and cooling of the air used in the ventilation of dining rooms, banquet and billiard halls in some of the most prominent clubhouses, as well as lodge halls and meeting rooms in many well-known buildings of fraternal organizations, offer evidence of the superiority of Webster Air Washers.

In the selection of heating and ventilating apparatus no committee should make a decision in the matter until they have investigated our method and secured prices upon Webster equipment.



Union League Club, Philadelphia

Equipped with a "Type A" Webster Air Washer, 40,000 cu. ft. capacity, central connection.

WEBSTER AIR WASHERS

THE CINCINNATI TIMES-STAR.

The Complete "Mickey" Orchestral Score is recorded on a Columbia Record—85c.

The Mabley and Carew Co.
CINCINNATI'S GREATEST STORE. FOUNDED 1877.

The Mercury Keeps Down at Mabley's

—A modern ventilating and cooling system keeps an even, comfortable temperature here at all times—making shopping at Mabley's a pleasureable and profitable.

A Few Cooling Thoughts

—Do not try to become easily provoked. It may when hot—make the sufferer only add to a bad weather discomfort.

—Do not get out of patience—but rather let speech for louder's mouth, because the other fellow's voice.

—Be generous—in the good cheerfulness, patience and generosity. It is a mighty good way to keep cool.

—Do not talk about the weather—if deserving, think about the weather.

—Don't be you.

—And last, but not least—wash all the time you can at MABLEY'S. Under good jaws are comfortable clothes. And always, when you are dressed, you are dressed.

—A good wash plays a part.

The results above referred to were secured by the use of a Webster Air Washer



The Mabley & Carew Company, Department Store, Cincinnati, Ohio
Equipped with a 40,000 cu. ft. "Type A" Webster Air Washer

ATMOSPHERIC CONDITIONING CORPORATION

Department Stores

The modern department store with its stock-laden shelves and vast areas can find no better method of keeping these areas crowded with patrons than to provide proper air conditioning with regard for comfort, simper and safety, and in case of any emergency installation of this type faces we find a case where the investment has found the investment asthorng but potential are only because of increased patronage but because of the saving of stock and decorations from deterioration due to moist climates.

Space will not permit the listing of our many installations throughout the country but will be glad to quote applica-



Kodge & Grossman, Department Store, Lincoln, Nebraska
Furnished with two pieces on W. "Type A" Wesley Air Washer.

WEBSTER AIR WASHERS



Hamilton County Court House, Cincinnati, Ohio

Equipped with five Webster Air Washers having a total capacity of 140,800 cu. ft. per minute



Municipal Building, Dallas, Texas

Equipped with a 30,000 cu. ft. "Type A" Webster Air Washer

Public Buildings

Webster Air Washers and cooling apparatus have been installed and are in successful operation in state capitols, county courthouses and other institutions—municipal buildings, jails, penitentiaries and Federal buildings of various types where the health and comfort of the occupants are considered.

Webster apparatus is recognized for its high points of excellence.



Indiana State Capitol, Indianapolis, Ind.

The House and Senate Chambers, also the State Museum, are provided with air conditioned from three separate Webster Air Washers.

The installations shown in this bulletin are selected from several hundreds of buildings and plants where Webster apparatus is in successful operation. To those particularly interested in the subject more detailed information will be furnished on request.

—WEBSTER AIR CONDITIONING APPARATUS—



Interior view showing spray piping and eliminators in the upper chamber of a Webster Dehumidifier used for conditioning the air in the new General Office Building of Morris & Co., Union Stock Yards, Chicago, Ill.

Industrial Plants

The necessity for installing air conditioning apparatus in industrial plants is being recognized more and more, the various types of apparatus being adaptable to practically every industry.

In plants where the nature of the product or peculiarity of the materials used in their production or manufacture gives off objectionable or dangerous dust, fumes or odors, the safeguarding of the health and the safety of operators must be considered.

The recent establishment of the Division of Industrial Hygiene and Medicine, Working Conditions Service, United States Department of Labor, in the large cities of this country will impress upon manufacturers the necessity for the installation of such equipment as we manufacture.



John B. Stetson & Co., Philadelphia, well known manufacturers of high grade men's hats

Equipped with Webster Air Washers

—WEBSTER AIR CONDITIONING APPARATUS—



Exterior view showing spray chamber side of Webster Dehumidifier installed in Morris & Co. General Office Building, Union Stock Yards, Chicago

Apparatus of 80,000 cu. ft. capacity

Dust and foreign matter brought into a workroom by the fan providing ventilation can often be removed from the entering air to within 2 per cent. of complete elimination, depending upon its nature, and where dust or very fine particles of a product are thrown off in the process of manufacture they can be caught before escaping into the breathing zone, thus fulfilling all requirements of the law.

Aside from the health and comfort of the employee there enters into the problem an element considered far more important by the manufacturer, for in many plants the presence of dust or foreign particles floating in the air represents a yearly loss in the form of goods spoiled.

In this class of industrials are naturally included such establishments as mills manufacturing fabrics and materials of a delicate nature, shops where painting, varnishing or the like is done, laboratories where photographic films are developed or dried, stores where manufactured goods will deteriorate, as well as all manufactories where candy or food products are prepared and made ready for the market.

The latter form a class to which attention has been called by the Pure Food authorities. This movement, national in its scope, proves unmistakably the necessity for sanitary methods of manufacture.

- The introduction of moisture and the maintenance of certain relative humidities is often essential to the perfect working of certain products, and with a Webster Humidifier ideal conditions can be maintained day in and day out the year around.

Where excessive humidity conditions are dangerous to the success of a given process or objectionable in the packing or storage rooms, the Webster Dehumidifier will be found equal to any climatic variation.

In some cases sufficient cooling can be secured by recirculating the spray water, but more often it is necessary to design a special apparatus where artesian well water is employed.

These are made in both the single and double stage type, the latter being among the highest developments of the art.

The refrigeration type of Webster Dehumidifier is, of course, the last word in Air Conditioning, and with this type of apparatus results can be secured that will outdo nature itself.

Industrial Ventilation and the details of equipment for maintaining artificial atmospheric conditions in industrial plants is a separate and advanced step in air washing, commonly termed Air Conditioning, or, as we term it, Atmospheric Conditioning.

This subject is treated more fully in a separate bulletin forming part of our general catalogue.

WEBSTER AIR CONDITIONING APPARATUS

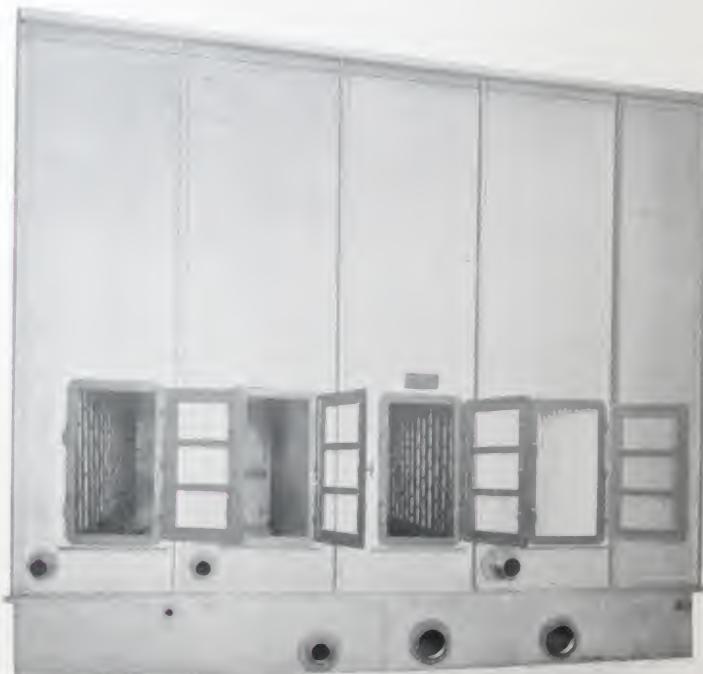
VARIOUS types of Webster Dehumidifiers are constructed to meet individual conditions.

If well water at a temperature of from 50 to 60 deg. is available in sufficient quantity, a single or multi stage well water dehumidifier is recommended.

If well water is not available, an ingeniously designed dehumidifier embodying the use of mechanical refrigerating apparatus is used.

Among the advantages to be gained by the use of the Webster System, as compared with earlier methods of cooling and dehumidifying, are:

1. Saving in power.
2. Economy in space.
3. More effective heat transfer.
4. Elimination of frosting.
5. Elimination of dirt and dust from air by washing.
6. Greater accuracy of control possible.
7. Automatic regulation can readily be secured by a simple scientific control system.



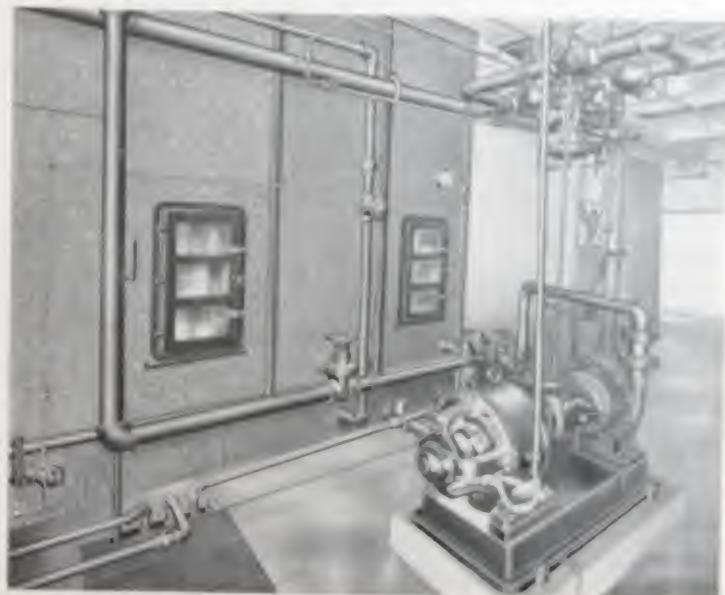
Webster Dehumidifier
Two Stage-Well Water Type

WEBSTER AIR CONDITIONING APPARATUS

THE Webster Humidifier is designed for use in connection with industrial plants, such as textile mills, where it is essential to the success and economy of production to add moisture to the air entering through the ventilating system and maintain automatically a uniform relative humidity.

Among the advantages gained by the use of the Webster Humidifying System may be mentioned:

1. Central location and control of entire humidifying plant.
2. Uniform humidity obtainable without the application of spray water in rooms.
3. Humidity may be maintained automatically at any desired point.
4. Entering air freed from dust and dirt by washing.
5. Lowering of temperature in summer by suspension of fine atomized water in humidifier.
6. Relative may be kept practically constant, assuring uniformity of product.
7. Elimination of static electricity.
8. Ample ventilation without opening air windows.
9. Great economy may be effected through heating system by normal circulation of air.



Webster Humidifier equipped with the Webster System of Humidity Control

Webster Air Washers

"Types GW. and GC." for Turbo Generator Ventilation

The design of an electric generator is always based on carrying a given load with a fixed maximum temperature in the armature and field windings.

Because of the very high speed at which the generators operate a large amount of power is obtained from a small, compact unit, and in order to accomplish this it becomes necessary to force relatively large quantities of cooling air through the air passages of the generator, which nearly always is provided with a fan, built in as an inherent part of the generator itself. The air passages are comparatively small, and if the air supplied is not clean, but carries with it dust, soot and oil particles, it will not be long before these passages become appreciably clogged, resulting in increased heating of the generator, reduction of capacity and burning out of the insulation. It is difficult and expensive to clean out a generator, therefore any device which keeps it free from dust and dirt is obviously of great value.

Generators usually reach their maximum efficiency at or above full load. The cooler the air delivered to the generator the greater is the load which it can carry, and in many instances an overload may safely be carried if the proper volume of clean, cool air is provided.

Our many years of experience with air washing and air cooling problems have enabled us to develop an apparatus which in every respect will fulfill the requirements in connection with generator ventilation.

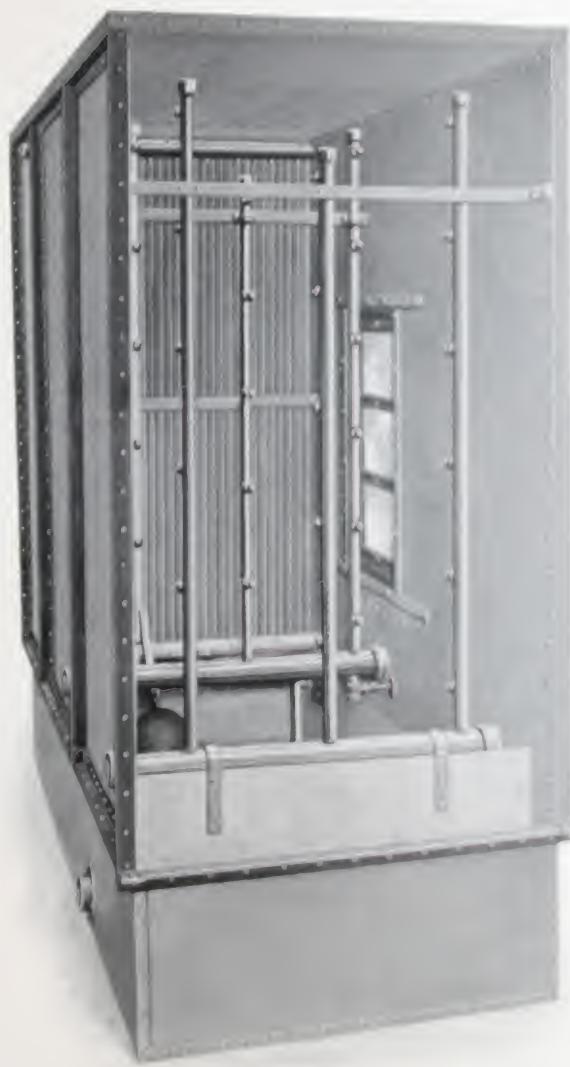
Webster Air Washers for Turbo Generator Ventilation are built on similar lines to those referred to in another part of this bulletin, but in view of the fact that in some localities and under certain conditions the cleansing of the air is considered paramount while at other times it is desired to secure also the greatest cooling effect possible, we manufacture apparatus of the two types.

The length of spray chamber and water volume handled in the "Type GW." apparatus while sufficient to remove 98 per cent. of the foreign matter from the incoming air, its cooling effect is far less than in the case of the "Type GC." apparatus.

This latter equipment is carefully designed and constructed, so that in addition to the 98 per cent. cleansing effect the incoming air can be reduced to within one degree of the wet bulb temperature.

The subject being a broad one it is impossible to cover all the points in such limited space, and those interested in this branch of air conditioning will find our special bulletin on the subject interesting and profitable reading.

TURBO GENERATOR VENTILATION



Webster "Type GC" Air Washer, for cleansing and cooling the air used in Turbo Generator Ventilation

Webster Air Washers

are adaptable to practically every type of building for either cleansing or cooling the air or both, for the comfort of the occupants or to maintain high efficiency among employees or students.

Webster Air Conditioning Apparatus

can be used with profit in industrial plants no matter what the product of manufacture may be.

This is evident from the following list showing types of buildings where our apparatus has been installed and is now in successful operation:

Automobile Plants	Glue Manufactories
Bakeries	Hat Manufactories
Ballrooms	Hotels
Bank Buildings	Hospitals
Banquet Halls	Laundries
Button Manufactories	Laboratories
Cafés	Leather Manufactories
Celluloid Products	Libraries
Chemical Plants	Lithographing
Churches	Municipal Buildings
City Halls	Newspaper Offices
Clubs	Office Buildings
Colleges	Packing Plants
Cooperage Plants	Penitentiaries
Courthouses	Power Plants
Dairy Products	Public Baths
Dairy Lunch Rooms	Public Service
Department Stores	Residences
Dryers	Railroad Depots
Dining Rooms	Restaurants
Dust Removal	Schools
Electric Lamp Works	Silk Mills
Exhibits	State Capitols
Experimental Plants	Telephone Exchanges
Film Manufactories	Textile Plants
Food Products	Theatres
Gas Mantel Manufactories	U. S. Post Offices

Dr. Hill Dust Counter

The simplest, most reliable and most satisfactory instrument ever designed for testing the purity of air for dust and for determining the efficiency of Air Washers and Air Conditioning Apparatus.

The invention of Dr. E. Vernon Hill, Chief of the Division of Ventilation, Chicago Department of Health, and used successfully in the work of the department.

Especially adapted for use by Boards of Health, Chemical and Physical Laboratories, Universities and Colleges, Hospitals, and Industrial, Mechanical and Consulting Engineers.



Dr. Hill Dust Counter (Patented)

COMPLETE EQUIPMENT INCLUDES THE FOLLOWING:

1 Exhaust Pump	A	1 Bottle Adhesive Mixture	F
3 Capsules	B, C, N	20 Feet of Rubber Tubing	I
1 T Connection	G	1 Book of Instructions	
2 Hose Nozzles		1 Sealgrain Carrying Case, Plush Lined,	
1 Slide Box; 12 Slides	H	Lock and Key.	
1 Cover Slip Box with 24 Cover Slips....	E		

Copy of Dr. Hill's Paper, "Quantitative Determination of Air Dust," will be sent on application.

Manufactured and for Sale by

ATMOSPHERIC CONDITIONING CORPORATION

ATMOSPHERIC CONDITIONING CORPORATION

originated in 1907 as a department of Warren Webster & Company, Camden, N. J., where Webster Air Washers and Air Conditioning apparatus were developed. Most complete experimental laboratories, equipped with every facility for tests and research, enabled us to develop a highly efficient apparatus.

Our first catalogue, published in 1911, was superseded by a more complete one in 1915, but advancement in the art has rendered this obsolete, so that we are now publishing a piece of literature in bulletin form of which this is but one part.

Each bulletin treats upon a different phase of air conditioning, the entire group, in loose-leaf cover, being a most complete treatise upon the subject.

These will be added to periodically so as to keep abreast of the times; such bulletins as are now available will be sent those who can use them in their work and desire to keep them for reference.

Our Executive, Engineering and Manufacturing departments are well organized to handle any class of air conditioning equipment and our sales organization includes not only an efficient force at our main office in Philadelphia, but territorial offices in the principal cities in the United States, Canada, and in London, England.

Executive Offices : Philadelphia

Factory : Camden, N. J.

New York	Chicago	Kansas City
Philadelphia	Milwaukee	Dallas
Pittsburgh	Indianapolis	Denver
Cleveland	Cincinnati	San Francisco
Detroit	St. Louis	Seattle

Canadian Representatives

Darling Brothers, Ltd., Montreal

Vancouver	Calgary	Winnipeg
Toronto	Ottawa	Halifax

European Representatives

Atmospheric Steam Heating Company, Ltd.
London, England

